

Description of the tadpole of *Bufo kisoensis*

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The tadpole of *Bufo kisoensis* from the Impenetrable Forest of extreme southwestern Uganda is described and compared with the tadpole of *Bufo maculatus*. The morphology of the *B. kisoensis* tadpole reflects the conservative morphology of the tadpoles in this genus but can be distinguished by a set of internal buccal characters, particularly the number and arrangement of the papillae.

INTRODUCTION

African tadpoles are relatively poorly known, especially those in the central and eastern parts of the continent. Tadpoles of 18 of 31 species of bufonids in central and southern Africa have been described (WAGER, 1965; VAN DIJK, 1971, CHANNING, 1972, 1973, 1978), and although buccal features provide useful taxonomic characters, these structures have been described for very few African *Bufo* tadpoles.

Bufo kisoensis is a large (males to 80 mm; females to more than 90 mm), high-altitude species known from above 2000 m in the highlands associated with the Albertine Rift of Kenya west of the Great Rift, northern Malawi and adjacent southern Tanzania (TANDY & KEITH, 1972). A member of the *B. regularis* complex, it was described as a subspecies of *B. regularis* (LOVERIDGE, 1932) and elevated to specific rank by LAURENT (1952). SCHMIDT & INGER (1959) confirmed the specific status and provided additional diagnostic characters.

The bright chrome yellow color of breeding males of *B. kisoensis* is unique among African *Bufo*. Except during breeding periods, males are cryptically colored like females. Sexual dichromatism (which may be permanent) also occurs in several other species of *Bufo*, such as *Bufo canorus* of California, *B. luetkenii* of Nicaragua and Costa Rica, the possibly extinct *B. periglenes* of Costa Rica, and *B. peripatetes* of Panama (SAVAGE, 1966; VILLA, 1972; SAVAGE & DONNELLY, 1992).

The *B. kisoensis* tadpoles were collected from a small stream (altitude 1700 m) within an area dominated by *Cyathea* and *Lobelia*. Adults in breeding condition and amplexing pairs were found in various habitats in the forest ranging from disturbed areas, through simple rush-sedge swamps, to complex *Acanthocleista-Cyperus-Thelypteris-Begonia* swamps (DREWES & VINDUM, 1994). The identification of the tadpoles is based on

B. kisoensis being the only bufonid in the forest proper (DREWES & VINDUM, 1994). *Bufo maculatus*, considered by TANDY & KEITH (1972) to be in a group of its own, occurs at lower elevations in the savannas of west and east Africa south to northeastern Kwazulu-Natal and breeds in low-elevation, disturbed habitats on the periphery of the Impenetrable Forest.

DESCRIPTION

Staging follows the table of GOSNER (1960), buccal features (stained with Fast Green) are described with the terminology of WASSERSUG (1976, 1980), descriptive characters and nomenclature are based on VAN DIJK (1966), and the keratodont formula follows the recommendations of DUBOIS (1995).

The description is based on one tadpole (stage 34, 19 mm total length) from over 90 tadpoles (California Academy of Sciences 180664) collected from the Impenetrable Forest Reserve in extreme southwestern Uganda by R. C. DREWES, H. W. GREENE, J. P. O'BRIEN and J. V. VINDUM on 5 November 1990. Comparisons with four other tadpoles from the sample that ranged from stages 31 to 41 and from 18 to 20 mm total length showed no appreciable differences in the characters we examined.

EXTERNAL FEATURES

The tail length (fig. 1) is 51 % of the total length, and tail height is slightly greater than body height. The tail tip is bluntly rounded. The maximum height of the dorsal fin occurs midway along the tail. The tail is euthoural with the extrapolated axis passing through the eye. The basal height of the caudal muscle is less than half (44 %) the height of the body.

The kidney-shaped nostrils with a slightly raised medial projection on the proximal margin are positioned slightly closer to the eye than to the snout. The nasal passages are visible dorsolaterally. The ratio nostril width/internarial distance is 0.15. The orbitonasal line and pineal spot are not visible. The ratio rostronasal distance (measured between closest margins)/orbitonasal distance is 1.6.

The eyes are dorsolateral, and the extra-ocular proportion (head width minus distance between the lateral limits of the eyes/distance between the lateral limits of the eyes) is 0.48. The spiracle is sinistral, visible dorsally, and situated 60 % posteriorly along the body; the flattened aperture is oval and visible laterally. The medial vent is situated on the ventral margin of the fin.

The ventral oral disc is not visible dorsally and is 75 % of the width of the head at the level of the disc. A single row of papillae is present laterally on the disc margin, and the mental gap is half the width of the disc. The suprarostrodont is finely serrated, edged with black and grading to a dark brown on the basal half. The widely V-shaped infrarostrodont is also finely serrated, and the distal half is deeply pigmented in brown. The keratodont formula is 1:1+1/3 (fig. 2).

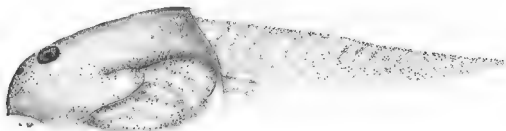


Fig 1 — Left lateral view of a tadpole of *Bufo kiziloensis* (California Academy of Sciences 180664; stage 34, 19 mm total length).

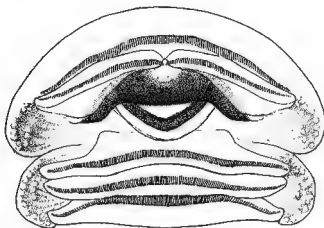


Fig. 2. — Mouthparts of a tadpole of *Bufo kiziloensis*.

Tab 1. - Comparison of the buccal anatomy of *Bufo maculatus* and *Bufo kisolensis* tadpoles.

<i>Bufo maculatus</i>	<i>Bufo kisolensis</i>
1 postnarial lateral papilla	2 postnarial lateral papillae, lateral one forms lateral margin of median ridge
Inner pair of postnarial arena papillae simple	Inner pair of postnarial arena papillae notched
4 pairs of lateral papillae in buccal roof arena	3 pairs of lateral papillae in buccal roof arena
A very large pustulation on either side of the anterior border of the velum	No such large pustulations
5-6 major papillae on each side of buccal floor arena	13 major papillae on each side of buccal floor arena

Dorsally the tadpoles are uniform dark brown rather than black as is common in many species of *Bufo*, and the venter a uniform lighter brown. The tail is evenly pigmented almost to the ventral margin over the anterior two thirds. The dorsal fin is uniformly pigmented, while the ventral fin is only pigmented anteriorly. Some tadpoles have a diffuse mottling on the ventral fin.

INTERNAL FEATURES

The internal nares are anteriorly convergent at about 50° to the midline. A pair of large, finely scalloped postnarial papillae form the lateral margin of the postnarial arena. This arena has a few small pustulations and two pairs of papillae. The median ridge is defined by a large central papilla and an elongated lateral papilla on each side. The buccal roof arena has a number of minute pustulations and three long lateral roof papillae on each side. A rounded area on the posterior midline stains darkly.

The buccal floor has an anterior raised lingual pad flanked by trilobed infralabial papillae and three smaller lingual papillae. The arena is flat with regularly-spaced minute pustulations and flanked by 13 elongated papillae on each side.

COMPARISONS AMONG AFRICAN BUFONID TADPOLES

The head ornaments of the tadpoles of the bufonid genera *Mertensophryne*, *Schismaderma* and *Stephopaedes* make them quite distinctive, but tadpoles of *Bufo* are quite uniform in morphology and size. Although internal buccal characters provide good characters for species identification, very little is presently known about these features in African *Bufo*. *Bufo maculatus* is the only other bufonid occurring near the Impenetrable Forest. The internal buccal anatomy of *B. kisoaloensis* differs from that of *B. maculatus* (LAMBIRIS, 1994, as *Bufo pusillus*) as listed in tab. 1. Although all known *Bufo* tadpoles have similar overall morphology, it appears that buccal characters are diagnostic at the species level. As more tadpoles become known, it will be possible to review the internal buccal anatomy for the members of the genus in Africa.

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